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## **Reading Performance of Iranian EFL Learners in Paper and Digital Texts**

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### **Abstract**

Dependence on computer and internet has given birth to digital literacy. However, research into its influences on the reading process is still in its infancy. To fill the gap, this study was designed to investigate the ways in which text presentation mode (paper vs. digital) affects reading comprehension, as well as reading attitudes. To this end, a sample of 30 male and female English major students doing their Master's (MA) participated in this study. Their reading comprehension was investigated by reference to the mode of text presentation, and their attitude towards either text type was examined through a self-assessment checklist. Results of the statistical Analysis of Variance (ANOVA) revealed a stronger preference for the paper-based texts, and an undifferentiated application of the same traditional method to all reading tasks. In addition, higher reading comprehension scores were obtained for paper-based texts, with male participants outperforming their female counterparts. The findings, providing further support for the significance of the mediating tools in the activity theory, imply that the digitalization of texts influences not only the nature of external behavior, but also of the mental functioning of individuals.

**Keywords:** activity theory, interactive theory, digital texts, paper-based texts, reading comprehension

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## 1. Introduction

Reading is an essential and probably the most important skill for foreign language learners (Grabe, 1991). Besides the comprehension of what is read is the basic goal for those who want to gain an understanding of the world and of themselves (Tierney, 2005).

Recent advancement in technology; however, has marked the beginning of a new form of reading, called digital reading, in which one employs complex graphics, animation, music, written and spoken text and user-interactivity to uncover meaning from texts. Digital literacy was predicted to impact both education and innovation significantly. For instance, in an early discussion of the influences of computers upon texts, Chartier (1995) asserted : “The substitution of the screen for codex is a far more radical transformation than that brought on by Gutenberg’s invention of the printing press; it changes the methods of organization, structure, consultation, and even the appearance of the written word.” (p. 15)

It appears that after about 20 years later, the development of the new multimedia literacy has become an obligation for the learners if they intend to join the growing global online community and encounter the likely challenges, and as a result be regarded as agents of change and ‘evangelizers’ of innovation (Caverly & Peterson, 2002, as cited in Shen, 2006). This necessitates learners to rethink some of their assumptions about the nature of reading and adopt the inherent possibilities of the digital texts in the comprehension of what they read .

Regarding the obsession for technological modernization, and considering the importance of online reading which affords the capacity to access huge information sources across our globe, especially for graduate students who are expected to do most of their college assignment web-based, and hence read digital texts, it is crucially significant to examine whether or not this new form of reading poses any challenge, as far as comprehension is concerned. Besides, as individual differences such as gender and attitude, may affect reading comprehension (Bügel & Buunk, 1996; McKenna, Kear & Ellsworth, 1995; Smith, 2002), investigating the issue, particularly with regard to digital literacy, would also be essential.

## 2. Literature Review

Popularity of computers, electronic readers and internet resources over the past 15 years has attracted researchers to look anew at the process of reading from the screen. The following section is intended to put the questions of this research in perspective to determine its potential contributions to the field.

### 2.1 Text type and reading comprehension

The studies on the effects of text presentation- medium on reading comprehension dates back only to the 80s. However, the results have been controversial. While some show differences in comprehension between paper and digital texts (Dillon, 1992; Noyes & Garland, 2003; Rice, 1994); some others report no significant differences (e.g. Grimshaw, Dungworth, Mcknight, Morris, 2007; Mayes, Sims, Koonce, 2001; Noyes & Garland, 2003). Yet, others support neither and demonstrate either inconsistent results or contradict the earlier findings.

Hence, Dillion (1992) concludes that the issue of comprehension has not been fully researched. For instance, in Mayes, Sims and Koonce (2001) whereas the results of their first experiment showed that those reading from paper text took longer to finish than those reading from screen, the results of a second experiment showed that there was no significant difference between comprehensions of two groups. In response to Mayes et al. (2001), Noyes and Garland (2003) examined directly comparable texts in the two media in terms of correct answers and memory retrieval measure among 50 students. While ratings indicated score improvement between pre-tests and post-tests and final achievement, learning memory awareness in conjunction with comprehension scores, the results showed no significant difference in terms of comprehension scores obtained through reading from the screen and paper texts. Similarly, Wayne (2003) divided the participants into three groups and exposed them to three different forms of text presentation. After reading the material for a period of time, they were evaluated on its content via a multiple-choice test. The results showed that the comprehension of groups who read from the printed text was significantly higher than the groups who read the texts from computer screen. Besides, females received higher comprehension scores than males. In the same vein, Wastlund, Reinikka, Norlander, Archer (2005) studied the effects with regard to condition and gender, but did not show any significant difference or any significant interaction effect. Findings showed that reading comprehension is more difficult when the assignment is presented upon a computer screen than upon paper. In sum, the results of their study implied that the digital presentation impaired performance in varied degrees and increased participants' experience of stress and tiredness. On the contrary, Joly, Capovilla, Bighetti, Neri, and Nicolau, (2009) evaluated the reading comprehension differences in 80 freshman students and concluded that the participants comprehended digital texts better than the printed texts. To close this section, while research implies that there are some basic differences between reading comprehension in computer-based and paper-based texts, the significance is largely uncertain. Thus further studies are

required to compare the differences with regard to reading context and readers' gender, because aside from the effect of text type on reading comprehension which is the main focus of the present study, some other factors, such as attitude and gender, may also impact comprehension.

## **2.2 Text type and attitude**

Many researchers agree that "readers' attitude" is one of the factors that might affect comprehension (McKenna, Kear & Ellsworth, 1995; Smith, 2002). They also maintained that readers' choices and preferences for reading medium are very diverse and contextual (Liu & Luo, 2011). Consequently, the researchers divided the studies on attitude with reference to their findings into three diverse groups: (1) Superiority of the printed text, (2) Superiority of digital texts, and (3) the Middle position / superiority of none.

### **2.2.1 Superiority of the printed text**

Cawkell (1999, cited in Auman, 2002) maintain that paper-based books are more natural than electronic books. Dorner (1996, as cited by Auman, 2002) refers to the digital books as one more sign that the world's gone mad. Similarly, Mangen's study (2008) criticizes digital reading for encouraging shallow forms of reading (e.g., scanning and skimming). Still others argue that reading from computer screens creates severe usability problems that the readers must cope with (Bus & Neuman, 2009; O'Hara & Sellen, 1997; Van Den Broek, Kendeou, & White, 2009). For instance, the large reading-distance from the display, the long lines, and the problem in shifting the eye-gaze from line to line (Evans, Charland, & Saint-Aubin, 2009) are some of the problems the readers have to solve. Green and Maycock (2004), and Alderson (2000) blame reading from computer screens for eye fatigue, and maintain that it is the reason why some readers do not prefer to read long texts from screen. In addition, text-fragmentation and the resulted decrease in text coherence (Ozuru, Dempsey, & McNamara, 2009), which are associated with the nonlinear nature of the digital text, can harm text comprehension (Chang & Ley, 2006; Van den Broek et al., 2009) and can cause readers with a high cognitive load (Ackerman, 2009) and disorientation (Armitage, Wilson & Sharp, 2004). Moreover, computers may cause anxiety when using or considering the use of a computer (Leso & Peck, 1992) which may weaken the processing of the texts (Ayersman & Reed, 1995; Dyck & Smither, 1994).

The proponents, such as Machovec (1996) argue that a computer screen or portable reading device cannot compete with the legibility of the printed page, nor can it mimic the flexibility and feel of a traditional book. Some other researches also reveal that students still cling to traditional paper

textbook in the digital age because it is easier (Foderato, 2010) and faster (Trey, 1999) to navigate through, highlight and take notes in the margin of the books. Darnton (2009) claims that nearly half of French students now still consider the smell of a print book to be a key aspect of their reading experience. Besides, Armitage et al. (2004) maintain that readers usually report on a stronger feeling of ownership when reading a printed text compared to a digital one. Such usability problems have led to extensive research efforts in order to characterize the nature of digital reading and learning, in comparison to reading from print (e.g. Baker, Bernard & Riley, 2002; Brady & Phillips, 2003; Brown, 2001; Evans et al., 2009; Reinking, 2005).

### **2.2.2 Superiority of digital texts**

In contrast to the first group, the proponents of the second view maintain that digital texts are superior to paper ones. Noam (1999) asserted that books are yesterday's technology, environmentally suspected, expensive, hard to find, impermanent, forever out of print, slow to produce, to write and to read, and a strain on the eye. He foresees that paper books will soon become a secondary resource in academia. In addition, other maintain that digital texts use zero paper and ink, lower cost by providing the works online, and thus they are more affordable than their print texts (Machovec, 1998, cited in Auman, 2002). According to Bersolin (cited in Boo, 1997) and Al-Amir (2009), some learners prefer reading from computer screen because they find it more enjoyable. James (2008) point out the advantages of computerized presentation of text over paper medium as: ease of searching, ease of updating, multimedia capabilities, dynamic text presentation, inexpensive and faster availability and interactivity.

**2.2.3 The middle position/ Superiority of none.** There is still a third group whose view about text presentation falls somewhere in between. They are the people who hold that electronic and print media will coexist in the future (Sellen & Harper, 2002; Liu, 2008). They reason that although digital texts are growing fast, people's preference for paper texts does not let paper disappear in digital age.

Needless to say, the findings related to attitude are so varied that further cross cultural and cross disciplinary studies are required to assess learners' perceived value regarding each text type.

## **2.3 Gender**

Although the issue of gender-based differences deserves more attention (Alderson, 2000), only a small number of reading studies have considered gender in second/foreign language acquisition. In addition, the studies available have reported inconsistent conclusions, most favoring females,

some favoring males and several others indicating no significant difference between genders (Brantmeier, 2001, 2002, 2003, 2004; Pae, 2004; Rosén, 2001; Young & Oxford, 1997). Besides, as the studies below indicate, the explanations provided for gender differences in reading comprehension vary and are not certain.

Connell and Gunzelmann (2004) claimed the relationship between gender and reading is a complex problem which is influenced by many factors including cultural, social, and biological. In addition, Brantmeier (2003), Bugel and Buunk (1996), Smith (2002), associated gender differences with the attitude regarding topic of the text. Some other studies found that gender differences in reading comprehension are related to different strategies that readers use (Chavez, 2001; Oxford, Felkins, Hollaway & Saleh 1996; Oxford, Park-Oh, Ito & Sumrall, 1993).

It should be mentioned that unlike most of the earlier gender related studies which focused on topic familiarity and reading strategies, the present study shifts the attention to the gender differences in comprehension across paper and digital text types—something which has received little attention so far. Among those few, Al- Amri (2009) studied 167 male and female first year medical students doing their English language intensive course at the College of Medicine in Saudi Arabia. Using ANOVA, he compared reading comprehension of the students in paper and digital types of The Test for English Majors, grade Four (TEM-4). Findings showed slight difference between male and female students regarding text type; however the difference was not significant. The results were in line with those of Higgins, Russell and Hoffmann (2005). More specifically, females scored higher on reading computer literacy and school use, while males scored higher on the computer fluidity and home use.

The review of gender related studies not only indicates controversial findings about gender differences, but also pinpoints the need for further studies on gender-neutral text to provide us with a better picture of the gender differences regarding reading comprehension.

As a conclusion, the results related to the effect of test type on comprehension, and attitude across genders were so inconsistent that further literature enrichment, especially in an EFL context, seems to be urgently required. In fact, research on reading in digital context, is either scarce or not directly related to the demands of the present research context. To the researcher's knowledge, Imamikia (2009) is the only research which is somehow related to the present study. She investigated the impact of web-based reading lessons on EFL students' reading comprehension, motivation and autonomy, and found that web-based lessons improved reading comprehension of learners. In addition, using qualitative methods, she

concluded that web-based lessons had positive effect on learners' motivation and increased their autonomy. However, her study is different from the present one, in that she conducted the study in online situation and examined the effect of web-based lesson. Therefore, the present study with the following research questions is believed to be contributory to the field.

1. What is the impact of text type on Iranian EFL learners' reading comprehension?
2. What is the role of gender on EFL learners' reading comprehension?
3. Which type of texts (paper or digital) do the students prefer?

Accordingly, it was hypothesized that:

1. Text type does not have any impact on EFL learners' reading comprehension.
2. Gender does not have any impact on reading comprehension of EFL learners.
3. EFL learners prefer paper-based texts.

### 3. Theoretical Framework

Reading is “a complex combination of processes” (Grabe, 2004, p.14) which involves the “activation of prior knowledge, the evaluation of the text, and a monitoring of the reader’s own comprehension” (Alderson, 2000, p. 3). Therefore, the present study is guided by two theories which fit its purposes more closely; namely, the “Activity Theory”, and the “Interactive Theory”.

The activity theory, developed by Cole and Engeström (1993), calls attention to the mediational role of the tool and state that the knowledge which is necessary in an activity system can emerge in any one or a combination of instruments, artifacts and mediational roles .

In addition, the study asserts that reading is an interactive process (Barnett, 1989; Carrell, Devine & Eskey, 1998) in which readers use both top-down and bottom-up skills (Abraham, 2000). That is, every component in the reading process interacts with each other, whether it is “high up” or “lower down” (Alderson, 2000, p. 18). This view is also in line with the Cole and Engeström (1993) that maintains reading is a mental activity during which textual elements are taken in and acted on by linguistic processes mediated by the individual reader’s characteristics, and that unskilled readers can use context clues for compensating for an incomplete bottom-up process (Rumelhart,1977; Perfetti, 1985; Stanovich, 1990; and Lee & Van Patten, 2003).

## 4. Method

The following section provides a detailed account of the method of this *ex post facto* study. More specifically, it is organized in the order of: sampling, measures, procedures, and analysis.

### 4.1 Sampling

Three predetermined features for the participants guided our sampling decision: The participants had to (1) have prior reading courses at academic level; (2) be in need of using digital texts for their studies; (3) be computer literate. Considering these assumptions, it was decided that English major students doing their master's (MA) be qualified as the participants for this study, because they were expected to read in both text types (digital and paper based) for fulfilling their course requirements.

To find the target participants with the characteristics cited above, the researchers employed the linear snowball sampling technique (figure 1), in which a small pool of initial informants, through their social networks, nominated other participants who met the eligibility criteria and could potentially contribute to the study.



Figure 1 Linear Snowball Sampling

The researchers used this sampling method because the sample for the study was limited to a very small subgroup of the population. However, as snowball sampling does not yield a random sample, a second part was added to the study so that each participant could explore his/ her preference for either text type based on a self-assessment checklist. This could cross validate the data and compensate for the deficiency.

To create the sample, two steps were taken: (a) trying to identify one or more units in the desired population; and (b) using these units to find further units and so on until the sample size is met. As finding the individuals who were willing to take part in the research was quite difficult, the aim was to start with just one or two students (i.e., one or two units). Next, the initial students helped to identify additional units for the sample. The process continued until sufficient units were identified to meet the desired sample size. The target sample size identified was 30 (16 females & 14 males) which was the right size for this research purpose (Gay, 1996). The participants (age range of 23-30) were students of different English related majors (Linguistics = 6, Literature = 4, and Teaching English as a Foreign Language = 20) from three Iranian state universities (Guilan, Allame



Tabatabaei and Tehran). These universities were selected because of their MA programs in various English related disciplines. All of the participants sat for two reading tests in digital and paper based formats, and thus provided two sets of data (N=60) which were used in further analyses.

## 4.2 Measures

This study employed three kinds of measures: paper- based reading passages (adopted from sample IELTS reading passages), digital-based passages (provided via a digital reader), and a self-assessment checklist. This last instrument helped the researchers measure the participants' preference for text type. The data collection procedure is detailed below.

### 4.2.1 Reading passages

In order to investigate the effect of text type (paper and digital) on EFL learner's reading comprehension; the researchers needed to test reading comprehension of the students in both paper and digital texts. Therefore, some passages of appropriate length and difficulty were required. The text readability index was obtained by consulting Farhady, et al., (2004). Accordingly, based on the readability of five random passages from among those covered by all students of linguistics, literature and TEFL, the researchers found the average Reading Ease of 40 and the standard deviation of approximately 8. Based on the equation ( $X \pm 1SD$ ), the values between 32 and 48 defined the acceptability range for the passages of this research.

Besides, in order to minimize topic familiarity effect, the topics had to have been discipline-neutral. Therefore, 4 reading passages (two texts for each type of test) from Cambridge Practice Tests for IELTS series (paper based and online versions) were selected. To control for the processing demand of the texts, as the reading passages in the IELTS reading module are ordered from easy to difficult, all of the passages were chosen from the first passages of this module. In addition, to eliminate the effect of question type on the answers, the researchers took great care to select passages with comprehension questions of more or less similar number and types. Details of selected passages for our research are presented in table 1 below.

Table 1. Details of selected passages

Features	TEXT 1 (P- based)	Text 2 (P- based)	Text 1 (D- based)	Text 2 (D- based)
<b>Title</b>	Implementing the Cycle of Success	The Politics of Pessimism	The Creation Myth	Nursing Absenteeism
<b>Readability</b>	36	47	43	41
<b>Question</b>	Five	Ten	Ten	Seven
<b>Types</b>	comprehension/	comprehension/	comprehension/	comprehension/

Features	TEXT 1 (P- based)	Text 2 (P- based)	Text 1 (D- based)	Text 2 (D- based)
	selection <i>multiple choice</i> items and 8 comprehension/ production <i>summary</i> <i>completion</i> ones	selection <i>multiple choice</i> items and 5 <i>Yes/No/Not</i> <i>Given</i> comprehension/ production ones.	selection <i>multiple choice</i> items and five <i>Yes/No/Not</i> <i>Given</i> comprehension/ production ones.	production <i>Yes/No/Not</i> <i>Given</i> items and 6 comprehension/ production note completion ones.
<b>Content Summary</b>	About the new policies of a very successful Australian hotel to develop an economically viable hotel organization model	About anxieties that have been created in the world because mankind cannot live by contentment alone.	About a myth that creativity of people is a gift from God and they are born with that gift.	About a longitudinal study that measured understood or managed the occurrence of absenteeism in Australia.

#### 4.2.2 Digital Reader

In order to measure reading comprehension of the participants in digital version, the researchers used "Mobipocket" reader which is a universal e-book reader for computers running windows 2000 (or newer) as well as windows mobile-based smart phones and other personal digital assistants (PDAs). It is free to download from (<http://www.mobipocket.com/>), and not like other readers very complicated. It downloads and sets up faster and also is more user- friendly. It includes an auto-column layout for an optimal reading experience, with options for page size, full width display, two or three column display with customizable font types, sizes and background colors to meet the readers' convenience and style. Besides, users can turn pages in the e-book with ease, bookmark notable sections to make a quick return, annotate and highlight, zoom in to get a close-up view of graphics and pictures, find, and search for text in any e-book, auto-scroll feature with varying degrees of speed and one click dictionary lookup, and many more options.

**4.2.3 Self-Assessment Checklist.** Having taken the reading comprehension tests, the participants were asked to self-assess themselves against a checklist (See Appendix). The items therein were designed based on the results of our earlier pilot studies and also those available in the existing literature. The participants were asked to select the text they preferred.

### 4.3 Procedures

After identifying the sample for the study, the researchers contacted each of the participants to arrange the time for attending a 100- minute testing session. All the participants were briefed on the aim of the research. Then they were divided into 10 groups of three according to their convenience. Test taking was administrated in five consecutive afternoons (at two different time options: 4.00 p.m.and6.00p.m.).The test venue was Allame Tabatabae English Language Institute which was equipped with the required equipment for this study.

In order to maintain the balance between the accessibility of information for reading comprehension of texts in two versions, the digital tests too were conducted offline. For each group, before the beginning of the tests, the researchers orientated the participants to Mobipocket reader and also the procedures of the test in 10 minutes. After that, the participants were asked to display their understanding of using the reader in a practice segment for another 10 minutes. The participants were told that although the normal time for taking each test was 20 minutes, they could continue the test to the end. Finally, the researchers informed the participants that they were expected to complete a self-assessment checklist at the end of the examination to rate their preferences for each text type.

In order to neutralize the effect of chance, fatigue and test order, the tests were given in counterbalanced design in the following order: paper test 1→ digital test 1→ paper test 2→ digital test 2. In addition, in order to reduce the time required for starting the digital test, as well as any possible problems that could occur during computer start-up, the researchers prepared the digital tests on all computers while the participants were busy taking the paper-based test. Finally, the participants rated their preferences in a checklist provided by the researchers.

### 4.4 Data analysis

Having gathered the data, the researchers used the Statistical Package for the Social Scientists (SPSS) software version 20.0 to seek answers to the research questions. For the first and second questions, the statistical Analysis of Variance (ANOVA) was considered to be appropriate because the study had one independent variable (text type with two layers: paper & digital) and one dependent variable (comprehension). For the third question; however, descriptive statistics was used to analyze the participants' preferences for text types.

## 5. Results & Discussion

### 5.1 Text type and reading comprehension

To answer the first question, preliminary analyses were performed to ensure that there was no violation of the assumptions of normality, linearity and homoscedasticity. Then researchers used one-way between-groups analysis of variance (ANOVA) to investigate the impact of text type on the reading comprehension of EFL learners. Looking at the last column of Table 2, it was found that there was a statistically significant difference at the  $p < .05$  level in comprehension scores [ $F(1, 58) = 9.8, p = .003$ ]. The effect size, calculated using eta squared, was 1.4, which according to Cohen (1998) is a large effect size.

Table 2. One-way ANOVA for the effect of text type on comprehension

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	26.667	1	26.667	9.768	.003
Within Groups	158.333	58	2.730		
Total	185.000	59			

In addition, the mean for comprehension of paper texts is 10.7 and for digital texts it is 9.3. As a result (See Table 3), the null hypothesis is rejected and it was concluded that reading comprehension in paper texts ( $M = 10.6, SD = 1.3$ ) was significantly higher than the reading comprehension in digital texts ( $M = 9.3, SD = 1.95$ ).

Table 3. Descriptive statistics for paper and digital comprehension

	Mean	Std. Deviation
Paper	10.6667	1.29544
Digital	9.3333	1.94464
Total	10.0000	1.77076

Reflecting on the findings for the first question, the researcher concluded that the results of the present study are in line with Kerr and Symons, (2006), Mayes et al. (2001), Noyes and Garland, (2003), Wastlund et al. (2005), and Wayne (2003). For instance, Kerr and Symons (2006) found that reading from computer screens impeded comprehension. That is, the participants were more efficient at comprehending the texts when reading from paper. Similarly, Wastlund et al. (2005) showed that the digital presentation impaired performance in varied degrees and increased participants' experience of stress and tiredness. Furthermore, Wayne (2003)

indicated that the comprehension scores of groups who read the printed version was significantly higher than the groups who read the texts presented through computers.

However, the results regarding reading comprehension are not unanimous. For instance, whereas Joly et al. (2009) showed that subjects comprehended digital texts better than the printed texts, some other researchers found that there was no significant difference between reading comprehension in paper and digital texts (Grimshaw et al., 2007).

In general; though, such findings are not in line with the current practices in educational contexts around the world, where many teachers and educators are trying to incorporate digital reading into their syllabuses to make their teaching tasks more efficient and comprehensive.

## 5.2 Gender and reading comprehension

To answer the second question, the researchers used ANOVA to investigate the impact of gender on reading comprehension of EFL learners. Looking at the last column of Table 4, we see that there was a statistically significant difference at the  $p < .05$  level in comprehension scores [ $F(1, 58) = 9.257$ ,  $p = .004$ ]. The effect size, calculated using eta squared, was 1.3 which, according to Cohen (1998) is a large effect size.

Table 4. One-way ANOVA for the effect of gender on comprehension

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25.463	1	25.463	9.257	.004
Within Groups	159.537	58	2.751		
Total	185.000	59			

In addition, Table 5 shows that the mean for comprehension of males is 10.7 and for females it is 9.4. Therefore, the null hypothesis is rejected and it can be concluded that reading comprehension of males ( $M = 10.7$ ,  $SD = 1.46$ ) was significantly higher than the reading comprehension of females ( $M = 9.4$ ,  $SD = 1.81$ ).

Table 5. Descriptive statistics for males and females' comprehension

	Mean	Std. Deviation
Female	9.3906	1.81274
Male	10.6964	1.46148
Total	10.0000	1.77076

The findings showed that male participants' comprehension was higher across text types. This refutes Al-Amri (2009), as well as Higgin, Russell and Hoffmann (2005) who found that there was no significant difference between gender and reading comprehension across text types. However, why such differences are observed calls for further research.

### 5.3 Text type preference

Participants' preference was assessed through a self-assessment checklist. Generally speaking, the results demonstrated that 73% of participants preferred paper texts, 14.5% digital text and 12.4% were indifferent towards text types. To be more revealing, the researchers classified the responses into 3 categories: strategic, psychological, and practical.

From the strategic perspective, a great percentage of the participants were more comfortable using reading facilitating strategies such as note taking (80%), and highlighting (60%) when reading from paper than from digital texts. Yet, from psychological perspective, although majority of participants found it less fatiguing(83.3%), and less stressful (73.3%) when reading from paper-- in fact 70% preferred paper texts for reading college textbook materials-- about 63% found digital texts more enjoyable than paper ones. Finally, in terms of practicality, a considerable percentage found paper texts more comfortable and easier to navigate through (86.7%), and easier to concentrate on (77%). The results are summarized in Table 6.

Table 6. Percentage of participant's preference of each text type

Questions	Paper	Digital	No Difference
1. In which version (paper or digital) you were more comfortable to take notes?	80	6.7	13.3
2. In which version did you use note taking more often?	80	6.7	13.3
3. In which version you were more comfortable to highlight?	60	26.7	13.3
4. In which version did you use highlighting more often?	63.3	26.7	10
5. Which text was less fatiguing?	83.3	3.3	13.3
6. Which text created less anxiety?	73.3	0	26.7
7. In which text were reading passages easier to navigate through?	86.7	10	3.3
8. Which text was more comfortable?	86.7	6.7	6.7
9. Which one was easier to concentrate?	90	0	10
10. Which text was more enjoyable?	30	63.3	6.7
11. Which one do you prefer for reading college textbook material?	70	10	20
Total	73.02	14.55	12.41

Therefore, despite the growth in computers and associated activities, Iranian students still show a preference for paper over computers. This preference for paper as a medium of reading is not in line with findings of Noam (1999) who asserted that books are yesterday's technology and digital texts are superior to papers. In addition, the findings of the present study support Machovec (1996) who claimed that a computer screen cannot compete with the legibility of the printed page, nor can it mimic the flexibility and feel of a traditional book. It implies that as many believe, paper is unlikely to disappear in the digital age (Sellen & Harper, 2002; Liu, 2008; Hassaskhah, 2013).

In addition, the findings support the results of the studies in which the participants found paper texts easier to highlight, take notes and navigate through (e.g. Foderato, 2010), less fatiguing (e.g. Alderson, 2000; Green & Maycock, 2004), and more relaxed (Ayersman & Reed, 1995; Dyck & Smither, 1994). Interestingly, while in general the participants claimed they were more comfortable with paper based texts, they also admitted that they did enjoy the experience of reading from the screen. This latter observation is valuable because it can be used as the basis to build upon to develop a more positive attitude towards digital texts, because as Brown (2000) maintains negative attitude may decrease motivation, impede input and interaction, and cause unsuccessful attainment of language proficiency (Brown, 2000).

## 6. Conclusions and Implications

With reference to the results of the study it can be concluded that the participants' comprehension was higher in paper texts rather than in digital ones. In addition, males' comprehension was higher than females'. Moreover, majority of the participants preferred paper texts. Therefore, according to the results that show higher reading comprehension and preference for paper based texts, the tool mediation principle of the activity theory, which claims that the mediating tool plays a central role in performance, finds support. In other words, as computer technology is the mediating tool in digital era, it is essential for all learners, including the EFL learners who are in need of having access to the state of the art information, to get educated in the properties of this tool as well as in the knowledge of how the tool should be used. Therefore, despite the status quo, it is required that teachers, policy makers, materials developers or any other individuals or organizations involved in education industry, to help promote the interactive nature of the features realized in digital texts and assist learners to gain motivation and a positive attitude toward using them. This is inevitable,

especially if we admit that technology is constantly improving, and that reading practices themselves are evolving as well.

Finally, it should be noted that this study, like many others, has some limitations which should be considered when generalizing the findings. For one thing, the study used snowball sampling which does not allow randomization; therefore, it is possible that different results might be obtained if the type of sampling differed. In addition, the assessment of reading comprehension in this study was based on limited item types such as multiple-choice yes/no/not given, note completion items. Thus, further research can be conducted using other types of items to compare the results. Finally, this research concentrated on reading digitally only through Mobipocket software. Since this software alone does not represent digital environment, further research is required to examine reading comprehension in the hypertext environment combined with images and sounds in order to check other electronic formats and their usefulness for educational purposes.

In conclusion, it should be emphasized that despite the limitations, this study is able to illustrate the potentials for change in classroom practice in ways that can be beneficial for students, teachers and curriculum program developers. The results imply that rather than deprecating digital technology as hurting our reading quality in the digital environment, its potentials ought to be embraced, and hope that technological advances will reduce the problems.

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